Ethnomathematical Exploration in Traditional Houses *or* Asmat Tribe as a Source of Mathematics Learning

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Abstract

This research is a qualitative study with an ethnographic approach. The purpose of this research is to analyze and describe the ethnomathematics activities, the mathematical elements found in the traditional Jew house of the Asmat tribe, and the mathematical elements in the Jew house that can be used as a source for mathematics learning. Data collection in this research was conducted through observation, interviews, and documentation. The instruments in this study are the research itself as the main instrument, along with supporting instruments in the form of interview guidelines and observation guidelines. Interviews were conducted with two informants, namely the Jew elders and the Asmat community, who are believed to have knowledge and understanding of how to build traditional houses and their components, as well as the meanings contained within these traditional houses. The research results show that there are ethnomathematics activities in the Jew traditional house, namely counting, locating, measuring, designing, and explaining. The mathematical elements found in the Jew traditional house are rectangles, triangles, cuboids and cubes, cylinders, arithmetic operations, area and volume, and distance. The results of this research can be used to develop mathematics learning tools.

Keywords: *Etnomathematics, Traditional House, Asmat Tribe.*

INTRODUCTION

Papua is home to many tribes that still hold fast to their culture and arts. This culture is very fundamental because it is the identity of various tribes in Papua and has a significant impact on the behavior and habits of the Papuan people who have many unique and diverse tribes. The culture in each region has its own uniqueness, one of which is Papuan culture. Papua has 255 indigenous Papuan tribes (Kho & Siep, 2022). One of the tribes in Papua is the Asmat tribe. Asmat is included in the Anim-Ha Traditional Area. The Asmat tribe has 12 groups, namely:

Aramatak, Becembub, Bismam, Bras, Emari, Ducur, Joerat, Kenekap, Safan, Simai, Unir Epmak, Unir Sirau, and Yupmakcain. The geographical location of each group is spread across the interior and coastal areas of the Arafuru Sea. Most of the Asmat people work as fishermen and hunters, gather sago, and catch fish in rivers (Jalo & Widodo, 2024). Traditional houses are one of the many cultures owned by the Asmat tribe. Traditional houses are traditional houses that have the cultural characteristics of each tribe in each region (Herawati et al., 2022). Traditional houses are also one of the highest forms of culture in a community (Yuningsih et al., 2021). Each traditional house has its own characteristics, as does the traditional house of the Asmat tribe, namely the house *Or*. Almost the same as other traditional houses, including the roof, doors and windows, but the house *Or* This is different from traditional houses in Indonesia, especially Papua, especially in the architecture of the building, which is elongated with a length of about 10-15 meters which resembles a rectangle and has rooms without partitions and has many doors. From this pattern it shows that the traditional house *or* resembles the concept of geometry. Geometry is a mathematical science that studies planes, space, points, lines, and measurements (Al Hafizin et al., 2018). These geometric concepts are one of the main topics in mathematics learning. Mathematics learning is known to be abstract and far from the reality of human life. Mathematics is a field of science that studies structure, patterns, logic, change, and space (Theola et al., 2024). Mathematics is used to think linearly in the context of theorems and formulas. The abstract characteristics of mathematics cause many students to feel anxious when studying mathematics, and most students have difficulty applying mathematics to real-life situations. This shows that learning mathematics is meaningless,

so that students' understanding of the concept is very weak. In addition, the reality is that learning is only based on achieving grades, not on understanding and how students solve the problems given. In fact, students do not realize that they have been using mathematics in their social lives for a long time. Therefore, teachers need to link the schemes that students already have and provide opportunities to rediscover and construct their own mathematical ideas. Therefore, mathematics learning really needs an ethnomathematics approach. One way to make learning mathematics more meaningful and easier is when mathematics is integrated into something simpler, such as culture. One example is that mathematics can be used to understand and analyze various forms of aesthetics in traditional house architecture. The structure of a traditional house can be understood mathematically, but its ornaments can be understood aesthetically (Yuningsih et al., 2021). Culture is a concept about how people live, think, feel, learn, and aspire to live according to their values. In other words, culture refers to social events and behaviors that reflect the identity and perceptions of a society. The culture of a society is also its way of life, shaped by various learning processes into a way of life that is most appropriate for a particular location and then passed on from one generation to the next. (Syakhrani & Kamil, 2022). Ethnomathematics shows the relationship between mathematics and culture. Mathematics and culture are related to each other and are passed down from generation to generation (Yuningsih et al., 2021). Ethnomathematics also includes concepts that include a number of mathematical ideas that can develop through culture (Kholisa, 2021). D'Ambrosio states that the term "ethnomathematics" was born from the word*" ethnomathematics "*, introduced by Brazilian mathematician D'Ambrosio in 1977.*Ethno*, *themes* as well as its component. The term ethno refers to a number of identifiable cultural groups including ethnic groups in a country or professional classes in society and their language and daily habits. Meanwhile, *they are black refers* to a specific explanation for understanding and modeling reality through calculating, measuring, classifying, sequencing, and modeling a number of patterns that arise in an environment. Suffix *tics* has the meaning of art in the technique itself. Ethnomathematics refers to mathematics used by certain cultural groups including ethnic groups, countries, certain professions, various children of specific ages and professional classes (D'ambrosio Ubiratan, 1985). Mathematics and culture cannot be separated from each other in social life. Wulandari (2021) states that wherever culture exists, mathematics also exists. Therefore, to maintain and realize the sustainability of culture and mathematics, education must involve both. Young (in Sutarto et al., 2021) explains that mathematics has a universal nature and cannot be separated from mathematical activities in everyday life. Ethnomathematics is the result of a tribe's research that includes mathematical ideas that are unknown to the local community (Zayyadi, 2021). Likewise in the culture of the Asamat tribe, namely in traditional houses which also have a number of mathematical elements in them.

METHOD

This type of research is qualitative research with an ethnographic approach. Ethnography is a research method to describe a culture (Spradley, 1997). According to Wijaya (2015), the ethnographic approach is a type of qualitative research about a person or group of people with the aim of further describing their cultural character in their own time and space. The object of research in this study is traditional houses. *Or* Asmat tribe in Suru Village, Agats District, Asmat Regency, South Papua. The instruments in this study were interview guidelines and observation guidelines. The techniques used in the study were observation, interviews, and documentation. To check the validity of the data, the researcher used diligent observation and source triangulation. The data that had been obtained were analyzed through three stages, namely data reduction, data presentation, and drawing conclusions/verification (Sugiyono, 2015).

RESULTS AND DISCUSSION

House *Or*is the traditional house of the Asmat Tribe. The house *or* different from

ordinary people's houses, where the location of the house from the beginning of its construction has always been on the edge of the river, and is separated from the other houses in the village because *or* serves as a defensive fortress against enemy attacks. The shape of the house *Or* longer and wider and higher than the houses around it. The house or known as a bachelor's house. Because it is often used as a place to equip boys who have entered adolescence who are required to live in *Or* until they are going to get married. Generally, they are taught customs, learn to beat the tifa and dance traditional dances, listen to stories of the heroism of their ancestors or stories about Fumeripit and see and get involved in activities carried out in *Or*. *Or* also used for traditional ceremonies, such as peace ceremonies, adoption ceremonies, initiation ceremonies, and inauguration ceremonies *or* new. This is what causes outsiders to call it *or* as a bachelor's house. Meanwhile, women are not allowed to enter *Or*. They are allowed to enter only on certain occasions such as ceremonial celebrations, rocking parties, and when bringing food to the people inside.

From the results of data collection, ethnomathematics activities in traditional houses were obtained. *R*as shown in Table 1.

Table 1. Analysis of the domain of home ethnomathematics activities *Or*.

Ethnomathematics activities	**Activities found**
Counting	Determine the number of support pillars, doors, furnaces and wood
Locating	Determine the location of the house and the location of the furnace.
Measuring	Measuring the size of the house to be built, making and installing the roof, the distance between doors, and the size of the stove.
Designing	Building a sturdy traditional house, techniques for connecting parts of the house, and the shapes of the parts of the house.
Explaining	Practical explanations (needs and beauty), and explanations according to cultural beliefs and values.

In accordance with the established domain, the results of the taxonomic analysis were obtained based on the mathematical concepts found in traditional houses *Or.*

Table 2. Taxonomic analysis of home ethnomathematics activities *Or.*

Ethnomathematics activities	**Activities found**	**Mathematical concepts**
Counting	Determine the number of support pillars, doors, furnaces and wood	Arithmetic operations
Locating	Determine the location of the house and the location of the furnace.	Place an object
Measuring	Measuring the size of the house and its parts, determining the distance between walls and doors	1. Area and volume of an object 2. distance
Designing	Determining the shape of the house and its parts	1. rectangle 2. cube 3. beam 4. tube 5. triangle

Based on the presentation of the results of the data analysis above, the following is a discussion of the findings found in traditional houses or related to school mathematics material, namely:

1. Rectangle

   The rectangular concept contained in the traditional house is in the roof and walls. Where the basic shape of the house is rectangular, the roof and walls of the house are also rectangular. In addition, the walls between the doors also have a rectangular shape. The rectangular concept in the house *Or* shown in Figure 1, Figure 2, and Figure 3.

Figure 1. Rectangle on the roof of the house*Or*.

Figure 2. Rectangle on the side wall of the house*Or*.

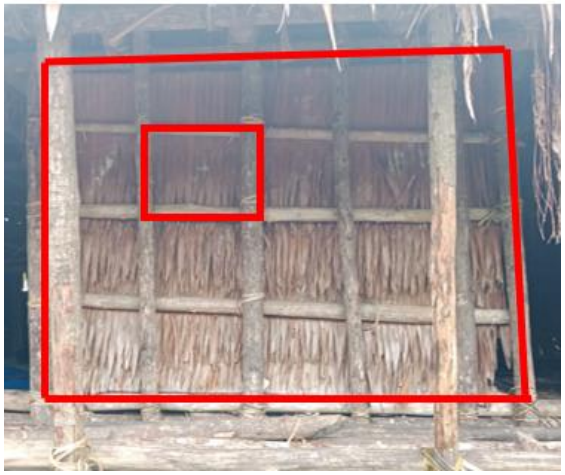

Figure 3. Rectangle on the wall between the house doors *Or*.

2. Cube

   The cube concept is found in the small stove section in the traditional house *Or*. The concept of cubes in the house *Or* shown in Figure 4.

Figure 4. Cube on a small furnace

3. Beam

   The concept of beams is found in the main furnace section. The concept of beams in the house*Or* shown in Figure 5.

Figure 5. Beams on the main furnace

4. Tube

   The concept of a tube in a traditional house *Or* This can be found on the pillars of the house. This happens because the community uses wood to make pillars, which wood is not shaped/shaved so that the shape remains like a tube. The concept of a tube in a house *Or* shown in Figure 6.

Picture 6. The tube on the pole of the house *Or*.

5. Triangle
   The concept of triangle in traditional houses *Or* can be found on the roof of a traditional house if observed from the side. The concept of a triangle in a traditional house *Or* shown in Figure 7.

Figure 7. Triangle on the side roof of the house *Or*.

6. Integer arithmetic operations
   This concept of number arithmetic operations is related to traditional houses. *Or* can be used to determine the number of pillars, the number of doors, the stove and wood for the floor used in the traditional house.
7. Area and volume
   The concept of area and volume when associated with traditional houses *Or* can be used to measure the size of the house to be built, as well as the parts of the traditional house.
8. Distance and position of objects
   The concept of distance and location of objects when associated with traditional houses *Or* can be used when determining the location of the house and the distance between doors.

CONCLUSION

Based on the description of the research results and discussion, the following conclusions can be drawn.

1. There are ethnomathematics activities in traditional houses namely activity counting, *locating, measuring, designing,* and *explaining.*
2. Mathematical elements found in traditional houses *Or* namely: rectangle, cube, block, triangle, number arithmetic operations, area and volume, distance and position of objects.
3. Mathematical elements found in homes *Or* which can be used as a source of learning mathematics, namely: Rectangles, Cubes, Blocks, Triangles, Cylinders, Integer operations, area and volume.

SUGGESTION

1. Based on the benefits of the research, it is hoped that there will be additional research based on ethnomathematics on the culture of the Asmat people and other tribes. To become a new concept in teaching mathematics.
2. Based on the research results obtained, this research can be used to develop school mathematics learning tools.

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BIBLIOGRAPHY

Libraries in the form of scientific magazines/journals:

Al Hafizin, M., Tendri, M., & Kusumawati, I. (2018). Analisis Kemampuan Spasial Siswa Pada Geometri Kubus Dan Balok Di Kelas IX SMP Negeri 03 Pulau Beringin. *Nabla Dewantara: Jurnal Pendidikan Matematika*, *3*(November), 60–65.

D'ambrosio Ubiratan. (1985). FLM Publishing Association Ethnomathematics and Its Place in the History and Pedagogy of Mathematics. *Source: For the Learning of Mathematics*, *5*(1), 44–48.

Herawati, A. D., Alvionita, K. A., & ... (2022). Eksplorasi Kajian Etnomatematika pada Rumah Adat Dulohupa Gorontalo. *Prisma, Prosiding …*, *5*, 335–345.

Jalo, F. V., & Widodo, A. (2024). Kepercayaan Animisme Dan Paham Ketuhanan Fumiripits Dalam Mitologi Suku

Asmat. *Divinitas Jurnal Filsafat Dan Teologi Kontekstual*, *02*(01), 121–134.

Kho, R., & Siep, M. (2022). Ethnomathematics of Dani tribes in Baliem valley in Wamena Papua. *AIP Conference Proceedings*, *2633*(September).

Sutarto, S., Ahyansyah, A., Mawaddah, S., & Hastuti, I. D. (2021). Etnomatematika: Eksplorasi Kebudayaan Mbojo Sebagai Sumber Belajar Matematika. *JP2M (Jurnal Pendidikan Dan Pembelajaran Matematika)*, *7*(1), 33–42.

Syakhrani, A. W., & Kamil, M. L. (2022). Budaya Dan Kebudayaan: Tinjauan Dari Berbagai Pakar, Wujud-Wujud Kebudayaan, 7 Unsur Kebudayaan Yang Bersifat Universal. *Journal Form of Culture*, *5*(1), 1–10.

Theola, C., Wardoyo, P., Veronica, L., Gomes, A., Rudhito, M. A., & Adat, R. (2024). *Etnomatematika Pada Rumah Adat Honai Suku Dani Dan Implementasinya Dalam Rancangan Pembelajaran Matematika*. *11*(1).

Wijaya, H. (2015). Research Method Spradley Model. *Jakarta: Salemba Humanika*, 283–284.

Wulandari, D. S. S. (2021). Eksplorasi Etnomatematika Makna Simbol Pakaian Pernikahan Adat Buton Kajian Semiotik. *Indonesian Journal of Educational Science (IJES)*, *4*(1), 91–99.

Yuningsih, N., Nursuprianah, I., & Manfaat, B. (2021). Eksplorasi Etnomatematika pada Rancang Bangun Rumah Adat Lengkong. *Jurnal Riset Pendidikan Matematika Jakarta*, *3*(1), 1–13.

Zayyadi, M. (2021). Eksplorasi Etnomatematika Padabatikmadura. *Jurnal Riset Pembelajaran Matematika*, *3*(1), 27–34.

Library In The Form Of Book Titles:

Spradley, J. P. (1997). *Metode Etnografi*. Tiadara Wacana.

Sugiyono. (2015). Metode Penelitian Pendidikan (Pendekatan Kuantitatif, Kualitatif dan R&D). *Penerbit CV. Alfabeta:Bandung.*

Tandililing, P. (2024). *Geometri Dalam Simfoni Budaya: Etnomatematika Toraja*. CV. Edupedia Publisher.

Library in the form of Seminar Proceedings:

Roeva, O. (2012). Real-World Applications of Genetic Algorithm. In *International Conference on Chemical and Material Engineering* (pp. 25–30). Semarang, Indonesia: Department of Chemical Engineering, Diponegoro University.

References in the form of dissertations/thesis:

Istadi, I. (2006). Development of A Hybrid Artificial Neural Network – Genetic Algorithm for Modelling and Optimization of Dielectric-Barrier Discharge Plasma Reactor. *PhD Thesis*. Universiti Teknologi Malaysia.

Patent Library:

Primack, H.S. (1983). Method of Stabilizing Polyvalent Metal Solutions. *US Patent No. 4,373,104*

Library in the form of a handbook:

Hovmand, S. (1995). Fluidized Bed Drying. In Mujumdar, A.S. (Ed.) *Handbook of Industrial Drying* (pp.195-248). 2nd Ed. New York: Marcel Dekker.

Website

United Arab Emirates architecture. (n.d.). Retrieved June 17, 2010, from UAE Interact website: http://www. uaeinteract.com/

Government Documents

Pusat Pembinaan dan Pengembangan Bahasa. (1978). *Pedoman Penulisan Laporan Penelitian*. Jakarta: Departemen Pendidikan dan Kebudayaan.